

What is Claimed is:

1. A semiconductor light emitting device comprising:
a substrate having a face;
a flexible film that includes therein an optical element, on the face; and
a semiconductor light emitting element between the substrate and the flexible
5 film and configured to emit light through the optical element.
2. A device according to Claim 1 wherein the face includes a cavity
therein, wherein the flexible film extends onto the face beyond the cavity, wherein the
optical element overlies the cavity and wherein the semiconductor light emitting
10 element is in the cavity.
3. A device according to Claim 1 wherein the optical element comprises a
lens.
- 15 4. A device according to Claim 1 wherein the optical element comprises a
prism.
5. A device according to Claim 4 wherein the semiconductor light
emitting element includes a wire that extends towards the flexible substrate and
20 wherein the prism is configured to reduce shadowing by the wire, of the light that is
emitted from the semiconductor light emitting element.
6. A device according to Claim 3 further comprising phosphor on the
flexible film between the lens and the semiconductor light emitting element.
25
7. A device according to Claim 6 wherein the lens includes a concave
inner surface adjacent the semiconductor light emitting element and wherein the
phosphor comprises a conformal phosphor layer on the concave inner surface.
- 30 8. A device according to Claim 2 wherein at least a portion of the flexible
film that overlies the cavity is transparent to the light and wherein at least a portion of
the flexible film that extends onto the face beyond the cavity is opaque to the light.

9. A device according to Claim 2 wherein at least a portion of the flexible film that overlies the cavity comprises a first material and wherein at least a portion of the flexible film that extends onto the face beyond the cavity comprises a second material.

5

10. A device according to Claim 2 wherein the semiconductor light emitting element includes a wire that extends towards and contacts the flexible film in the cavity and wherein the flexible film includes a transparent conductor in the cavity that electrically connects to the wire.

10

11. A device according to Claim 2 wherein the optical element comprises a lens that overlies the cavity and protrudes away from the cavity, the flexible film further comprising a protruding element between the lens and the semiconductor light emitting element that protrudes towards the cavity.

15

12. A device according to Claim 11 further comprising a conformal phosphor layer on the protruding element.

13. A device according to Claim 1 wherein the flexible film includes a first face adjacent the substrate and a second face remote from the substrate and wherein the optical element comprises a first optical element on the first face and a second optical element on the second face, both of which are located such that the light emitting element emits light through the first optical element and the second optical element.

25

14. A device according to Claim 1 further comprising an attachment element that is configured to attach the flexible film and the substrate to one another.

15. A device according to Claim 1 wherein the optical element is a first optical element and the semiconductor light emitting element is a first semiconductor light emitting element, the flexible film including therein a second optical element that is spaced apart from the first optical element, the device further comprising a second semiconductor light emitting element between the substrate and the flexible film and configured to emit light through the second optical element.

30

16. A device according to Claim 15 wherein the face includes first and second cavities therein, wherein the flexible film extends onto the face beyond the first and second cavities, wherein the first optical element overlies the first cavity,
5 wherein the first semiconductor light emitting element is in the first cavity, wherein the second optical element overlies the second cavity and wherein the second semiconductor light emitting element is in the second cavity.

17. A device according to Claim 16 further comprising a first phosphor
10 layer on the flexible film between the first optical element and the first semiconductor light emitting element and a second phosphor layer on the flexible film between the second optical element and the second semiconductor light emitting element.

18. A device according to Claim 17 wherein the first and second phosphor
15 layers comprise different phosphors.

19. A device according to Claim 15 wherein the face includes a cavity therein, wherein the flexible film extends onto the face beyond the cavity, wherein the first optical element overlies the cavity, wherein the first semiconductor light emitting
20 element is in the cavity, wherein the second optical element overlies the cavity and wherein the second semiconductor light emitting element is in the cavity.

20. A device according to Claim 19 further comprising a first phosphor
layer on the flexible film between the first optical element and the first semiconductor
25 light emitting element and a second phosphor layer on the flexible film between the second optical element and the second semiconductor light emitting element.

21. A device according to Claim 20 wherein the first and second phosphor
layers comprise different phosphors.

30 22. A device according to Claim 1 wherein the semiconductor light emitting element comprises a light emitting diode.

23. A device according to Claim 15 wherein the flexible film includes therein a third optical element that is spaced apart from the first and second optical elements, the device further comprising a third semiconductor light emitting element between the substrate and the flexible film and configured to emit light through the
5 third optical element.

24. A device according to Claim 23 further comprising a first phosphor layer on the flexible film between the first optical element and the first semiconductor light emitting element, a second phosphor layer on the flexible film between the
10 second optical element and the second semiconductor light emitting element and a third phosphor layer on the flexible film between the third optical element and the third semiconductor light emitting element.

25. A device according to Claim 24 wherein the first phosphor layer and
15 the first semiconductor light emitting element are configured to generate red light, the second phosphor layer and the second semiconductor light emitting element are configured to generate blue light and the third phosphor layer and the third semiconductor light emitting element are configured to generate green light.

20 26. A device according to Claim 1 wherein the optical element comprises phosphor.

27. A device according to Claim 26 wherein the optical element comprises a lens having phosphor dispersed therein.

25 28. A device according to Claim 1 wherein the optical element comprises an optical emission enhancing and/or converting element.

29. A device according to Claim 1 wherein the optical element comprises
30 an optical scattering element.

30. A device according to Claim 1 further comprising an optical coupling media between the optical element and the semiconductor light emitting element.

31. A device according to Claim 2 further comprising an optical coupling media in the cavity between the optical element and the semiconductor light emitting element.

5 32. A device according to Claim 6 further comprising an optical coupling media between the phosphor and the semiconductor light emitting element.

33. A device according to Claim 11 further comprising an optical coupling media between the protruding element and the semiconductor light emitting element.

10

34. A device according to Claim 12 further comprising an optical coupling media between the conformal phosphor layer and the semiconductor light emitting element.

15 35. A method of assembling a semiconductor light emitting device comprising:
mounting a semiconductor light emitting element on a substrate face; and
attaching a flexible film that includes therein an optical element, to the
substrate face, such that, in operation, the semiconductor light emitting element emits
20 light through the optical element.

36. A method according to Claim 35:
wherein the face includes a cavity therein;
wherein mounting a semiconductor light emitting element on a substrate face
25 comprises mounting a semiconductor light emitting element in the cavity; and
wherein attaching a flexible film comprises attaching a flexible film that
includes therein an optical element, to the substrate face, such that the flexible film
extends onto the face beyond the cavity and the optical element overlies the cavity.

30 37. A method according to Claim 35 wherein the optical element comprises a lens, a prism, phosphor, an optical emission enhancing and/or converting element and/or an optical scattering element.

38. A method according to Claim 35 wherein attaching a flexible film is preceded by forming a phosphor layer on the flexible film, adjacent the optical element.

5 39. A method according to Claim 35 wherein attaching a flexible film is preceded by:

forming the optical element; and

forming the flexible film surrounding the optical element.

10 40. A method according to Claim 35 wherein attaching a flexible film is preceded by:

forming the optical element from a first material; and

forming the flexible film from a second material that is attached to the first material.

15

41. A method according to Claim 35 wherein attaching a flexible film is preceded by forming a transparent conductor on the flexible film.

20 42. A method according to Claim 35 wherein mounting a semiconductor light emitting device on a substrate face comprises:

mounting a plurality of semiconductor light emitting elements on a substrate face; and

25 wherein attaching a flexible film comprises attaching a flexible film that includes a plurality of optical elements to the substrate face, such that, in operation, a respective semiconductor light emitting element emits light through a respective optical element.

30 43. A method according to Claim 42 wherein mounting a plurality of semiconductor light emitting elements on a substrate face comprises mounting a plurality of semiconductor light emitting elements in a corresponding plurality of cavities in the substrate face.

44. A method according to Claim 42 wherein mounting a plurality of semiconductor light emitting elements on a substrate face comprises mounting a

plurality of semiconductor light emitting elements in a single cavity in the substrate face.

45. A method according to Claim 35 wherein the following is performed
5 between mounting a semiconductor light emitting element and attaching a flexible film:

placing an optical coupling media between the semiconductor light emitting element and the optical element.

10 46. A method according to Claim 36 wherein the following is performed between mounting a semiconductor light emitting element and attaching a flexible film:

placing an optical coupling media in the cavity.